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Hitachi Universal Storage Platform V
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Hitachi LUN Expansion User's Guide

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Hitachi Data Systems

MK-96RD616-11

Contents

Preface

This document describes and provides instructions for using the LUN Expansion software to configure and perform LUN Expansion operations on the Hitachi Universal Storage Platform V and Hitachi Universal Storage Platform VM (USP V/VM) storage systems.

Please read this document carefully to understand how to use this product, and maintain a copy for reference purposes.

This preface includes the following information:

Notice: The use of LUN Expansion and all other Hitachi Data Systems products is governed by the terms of your agreement(s) with Hitachi Data Systems.

Intended Audience

This document is intended for system administrators, Hitachi Data Systems representatives, and Authorized Service Providers who are involved in installing, configuring, and operating the USP V/VM storage systems.

This document assumes the following:

- The user has a background in data processing and understands RAID storage systems and their basic functions.
- The user is familiar with the USP V/VM storage systems and has read the *Universal Storage Platform V and Universal Storage Platform VM User's and Reference Guide*.
- The user is familiar with the Storage Navigator software for the USP V/VM and has read the *Storage Navigator User's Guide*.
- The user is familiar with the operating system and web browser software on the system hosting the Storage Navigator software.

Product Version

This document revision applies to Universal Storage Platform V/VM microcode 60-08-0*X* and higher.

Document Revision Level

Revision	Date	Description
MK-96RD616-01	May 2007	Initial release
MK-96RD616-02	July, 11 2007	Revision 2, supersedes and replaces MK-96RD616-01
MK-96RD616-03	September 2007	Revision 3, supersedes and replaces MK-96RD616-02
MK-96RD616-04	November 1 2007	Revision 4, supersedes and replaces MK-96RD616-03
MK-96RD616-05	January 2008	Revision 5, supersedes and replaces MK-96RD616-04
MK-96RD616-06	March 2008	Revision 6, supersedes and replaces MK-96RD616-05
MK-96RD616-07	August 2008	Revision 7, supersedes and replaces MK-96RD616-06
MK-96RD616-08	November 2008	Revision 8, supersedes and replaces MK-96RD616-07
MK-96RD616-09	January 2009	Revision 9, supersedes and replaces MK-96RD616-08
MK-96RD616-10	June 2009	Revision 10, supersedes and replaces MK-96RD616-09
MK-96RD616-11	April 2011	Revision 11, supersedes and replaces MK-96RD616-10

Source Documents for this Revision

- MK-96RD616-11a

Changes in this Revision

- Revised information noting that up to 36 LDEVs can be combined in a LUSE configuration using the LUSE function (see LUSE Function).
- Updated text by adding references to host support for Windows Server 2003 and 2008 (see LUSE Operations Using a Path-defined LDEV).

Document Organization

The following table provides an overview of the contents and organization of this document. Click the chapter title in the left column to go to that chapter. The first page of each chapter provides links to the sections in that chapter.

Chapter	Description
Chapter 1 - About LUSE Operations	Provides an overview of LUSE operations.
Chapter 2 - Preparing for LUSE Operations	Describes the environment you need to prepare in order to operate LUSE.
Chapter 3 - Using the LUSE GUI	Describes the GUI for LUN Expansion (LUSE) operations.
Chapter 4 - Performing LUSE Operations	Provides specific instructions for performing LUSE operations.
Chapter 5 - Using Spreadsheets for LUSE Operations	Describes how to write and use spreadsheets for LUSE operations for example, when you want to create or release many LUSE volumes at a time.
Chapter 6 - Troubleshooting	Explains how to troubleshoot problems that you might experience while using LUSE.
Acronyms and Abbreviations	Defines the acronyms and abbreviations used in this document.
Index	Lists the topics in this document in alphabetical order.

Referenced Documents

Hitachi Universal Storage Platform V/VM:

- *Hitachi Copy-on-Write Snapshot User's Guide*, MK-96RD607
- *Hitachi Performance Manager User's Guide,* MK-94RD218
- *Hitachi Storage Navigator Messages,* MK-96RD613
- *Hitachi Storage Navigator User's Guide*, MK-96RD621
- *Hitachi Universal Volume Manager User's Guide,* MK-96RD626
- *Hitachi Virtual Partition Manager User's Guide,* MK-96RD629
- *User's and Reference Guide,* MK-96RD635

Document Conventions

The terms "Universal Storage Platform V" and "USP V" refer to all models of the Hitachi Universal Storage Platform V, unless otherwise noted.

The terms "Universal Storage Platform VM" and "USP VM" refer to all models of the Hitachi Universal Storage Platform VM, unless otherwise noted.

This document uses the following typographic conventions:

Convention	Description
Bold	Indicates text on a window, other than the window title, including menus, menu options, buttons, fields, and labels. Example: Click **OK**.
Italic	Indicates a variable, which is a placeholder for actual text provided by the user or system. Example: copy *source-file target-file* Angled brackets (< >) are also used to indicate variables.
`screen/code`	Indicates text that is displayed on screen or entered by the user. Example: `# pairdisplay -g oradb`
< > angled brackets	Indicates a variable, which is a placeholder for actual text provided by the user or system. Example: `# pairdisplay -g <group>` Italic font is also used to indicate variables.
[ ] square brackets	Indicates optional values. Example: [a | b] indicates that you can choose a, b, or nothing.
{ } braces	Indicates required or expected values. Example: { a | b } indicates that you must choose either a or b.
| vertical bar	Indicates that you have a choice between two or more options or arguments. Examples: [a | b] indicates that you can choose a, b, or nothing. { a | b } indicates that you must choose either a or b.
underline	Indicates the default value. Example: [a | b]

This document uses the following icons to draw attention to information:

Icon	Meaning	Description
	Note	Calls attention to important and/or additional information.
	Tip	Provides helpful information, guidelines, or suggestions for performing tasks more effectively.
	Caution	Warns the user of adverse conditions and/or consequences (e.g., disruptive operations).
	WARNING	Warns the user of severe conditions and/or consequences (e.g., destructive operations).

Convention for Storage Capacity Values

Physical storage capacity values (e.g., disk drive capacity) are calculated based on the following values:

1 KB = 1,000 bytes
1 MB = $1{,}000^2$ bytes
1 GB = $1{,}000^3$ bytes
1 TB = $1{,}000^4$ bytes
1 PB = $1{,}000^5$ bytes

Logical storage capacity values (e.g., logical device capacity) are calculated based on the following values:

1 KB = 1,024 (2^{10}) bytes
1 MB = 1,024 KB or $1{,}024^2$ bytes
1 GB = 1,024 MB or $1{,}024^3$ bytes
1 TB = 1,024 GB or $1{,}024^4$ bytes
1 PB = 1,024 TB or $1{,}024^5$ bytes
1 block = 512 bytes

Getting Help

If you need to call the Hitachi Data Systems Support Center, be sure to provide as much information about the problem as possible, including:

- The circumstances surrounding the error or failure.
- The exact content of any error messages displayed on the host system(s).
- The exact content of any error messages displayed by Storage Navigator.
- The USP V/VM Storage Navigator configuration information obtained by using the FD Dump Tool
- The service information messages (SIMs), including reference codes and severity levels, displayed by Storage Navigator and/or logged at the host.

The Hitachi Data Systems customer support staff is available 24 hours a day, seven days a week. If you need technical support, log on to the Hitachi Data Systems Portal for contact information: https://hdssupport.hds.com

Comments

Please send us your comments on this document: doc.comments@hds.com. Include the document title, number, and revision, and refer to specific section(s) and paragraph(s) whenever possible.

Thank you! (All comments become the property of Hitachi Data Systems Corporation.)

1

About LUSE Operations

This chapter gives an overview of LUN Expansion (LUSE) operations:

- ☐ Overview of LUN Expansion (LUSE)
- ☐ LUSE Function
- ☐ LUSE Guidelines

Overview of LUN Expansion (LUSE)

LUN Expansion (LUSE) operations allow hosts that can use only a limited amount of logical units (LUs) per fibre interface to have access to larger amounts of data by using expanded LUs.

LUSE Function

LUN Expansion (LUSE) is a function for open systems. To use this function, you need the software called Open Volume Management.

The LUSE function is applied to open-system logical volumes and allows you to configure one large logical volume by combining several small LDEVs. The LUSE function allows hosts that can use only a limited amount of LUs per fibre interface to have access to larger amounts of data by using expanded LUs.

Figure 1-1 shows the LUSE configuration. By using the LUSE function, you can combine several logical devices (LDEVs) or volumes into one large logical volume. Up to 36 LDEVs can be combined. The ID of the logical volume defined as the large logical volume is represented by the smallest LDEV ID (assigned to the top LDEV). The host recognizes the expanded logical volume as one representative LDEV. As long as the number of LDEVs combined into one large logical volume does not exceed the specified limit (see Table 1-1), you can arbitrarily select any LDEVs as the volumes to combine, regardless of their size (or capacity) or whether they are on the same CU (Control Unit) or not. The LUSE function also allows you to combine several LDEVs and a LUSE volume (combined LDEVs) into one LUSE volume, or combine LUSE volumes together into one LUSE volume.

Before the host can access each LDEV composing an expanded LU (LUSE volume) you must release the expanded LU.

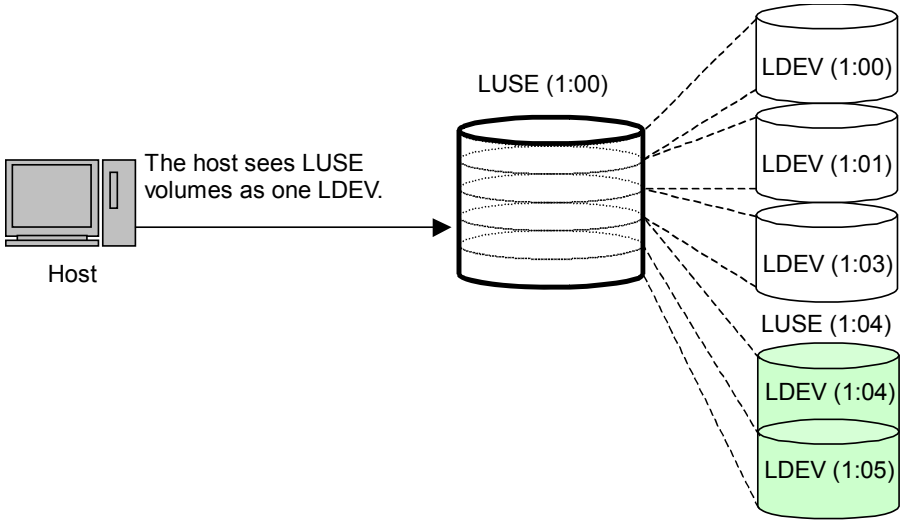

Figure 1-1 LUSE Configuration

If you want to create an open-systems volume (LU) larger than 2.8 TB, you must use LUSE to combine open-systems volumes.

Whether hosts can access a volume larger than 2 TB depends on operating systems of the hosts. Hosts running the following operating systems can access LUSE volumes larger than 2 TB.

- AIX 5.2 TL08 or later
- AIX 5.3 TL04 or later
- Windows Server 2003 SP1 or later
- Red Hat Enterprise Linux AS 4 Update 1 or later

Cautions:

- Other operating systems do not support LUs larger than 2 TB. If other operating systems are used by hosts, make sure that LUs are not larger than 2 TB.
- For information about the maximum LU capacity supported by your operating system, contact the vendor of your operating system.

LUSE Guidelines

Table 1-1 lists the specifications and restrictions on LDEVs used to configure a LUSE volume.

Table 1-1 Specifications and Restrictions on LDEVs Used to Configure a LUSE Volume

No.	Specifications and Restrictions
1	Open volumes (OPEN-3, OPEN-8, OPEN-9, OPEN-E, OPEN-L, and OPEN-V) are supported.
2	The number of LDEVs combined into a LUSE volume must be within the range of 2 to 36. The number of expanded LUs (LDEVs) should not exceed 36, even if the LUSE volume contains another LUSE volume.
3	The emulation type of the LDEVs combined into a LUSE volume must be the same.
4	The RAID level of the LDEVs that are to be combined into LUSE volumes should be the same. (Recommended). Combining RAID 1 and RAID 5 volumes into the same LUSE volume is supported, but not recommended.
5	LDEVs or LUSE volumes that are to be combined must have no assigned path definitions. For this reason, the volumes used by TrueCopy for IBM z/OS®, TrueCopy, ShadowImage for IBM z/OS®, ShadowImage, Copy-on-Write Snapshot, and Universal Replicator cannot be targets of LUSE operations (see LUSE Operations Using a Path-defined LDEV).
6	LDEVs that are to be combined into LUSE volumes must not be reserved for Volume Migration. For more information on Volume Migration, contact the Hitachi Data Systems Support Center (see Calling the Hitachi Data Systems Support Center).
7	When combining a LUSE volume with another LUSE volume, the range of LDEVs should not be overlapped. If combining LDEV00, LDEV03 and LDEV05 into **LUSE 1**, LDEV02 and LDEV04 into **LUSE 2**, and LDEV06 and LDEV07 into **LUSE3**, you can also combine **LUSE 1** and **LUSE 3**. However, you cannot combine **LUSE 1** and **LUSE 2**, because the LDEV range in **LUSE 1** and **LUSE 2** is overlapped.
8	The maximum capacity of a LUSE volume is 60 TB. Any LUSE volume contains up to 4 MB of disk area to be used for controlling the volume, and this disk area cannot contain user data. Therefore, the maximum capacity for user data in a LUSE volume is smaller than 60 TB.
9	Combining command devices into a LUSE volume is not supported.
10	The access attribute must be set to Read/Write.
11	Combining internal volumes, external volumes, and virtual volumes (V-VOLs) is not supported.
12	While online, the host mode must be neither 0x0C (Windows) nor 0x01 (VMWare).
13	The cache mode settings of the LDEVs combined into a LUSE volume must be the same.
14	All the LDEVs combined into a LUSE volume must be of the same drive type. (However, SATA drives and BD drives can be intermixed).
15	LDEVs are not pool volumes (pool-VOLs).
16	LDEVs are not journal volumes.
17	LDEVs are not system volumes.
18	LDEVs are not virtual volumes of Dynamic Provisioning (V-VOLs).
19	LDEVs are not quorum disks.

No.	Specifications and Restrictions
20	If the top LUSE volume is an LDEV, the LDEV number of the LDEV that is combined should be larger than the top LDEV number.
21	If the top LUSE volume is a LUSE volume, the LDEV number of the LDEV that is combined should be larger than the last LDEV number of LUSE volume.
22	The protection levels of LDEVs used to configure a LUSE volume should be the same. (Recommended) For details about the protection level, see information about the Data Protection Level in LUN Expansion Window.

Table 1-2 lists the specifications and restrictions on LDEVs released from a LUSE volume.

Table 1-2 Specifications and Restrictions on LDEVs Released from a LUSE Volume

No.	Specifications and Restrictions
1	The LUSE volume must not have any defined path.
2	The access attribute must be set to Read/Write.

LUSE Operations Using a Path-defined LDEV

When you create a LUSE volume, the top LUSE volume can be either an LDEV or a LUSE volume that has one or more paths defined to it. Only the top volume in the LUSE volume to be created can have any paths. The other volumes in the LUSE volume to be created must not have any paths.

You can perform a LUSE operation using a path-defined LDEV regardless of how many paths are defined to the LDEV. You cannot combine a path-defined LDEV or LUSE volume with another path-defined LDEV or LUSE volume.

When you start the LUSE operation to combine a path-defined LDEV or LUSE volume with another path-defined LDEV or LUSE volume, a dialog box will open with a message asking if you want to continue the operation. Click **OK** if you want to continue or **Cancel** if you do not.

When performing a LUSE operation using a path-defined LDEV, consider the host operating system to ensure that the host mode is correctly defined. The following table lists host modes for defined paths by operating system:

Table 1-3 Host Mode for Defined Paths by Operating System

Operating System	Host Mode
Windows 2000	Host mode is 2C
Windows Server 2003	Host mode is 2C
VMware	Host mode is 21
AIX5.2	Not applicable
AIX5.3	Not applicable

An LDEV can be used for LUSE operations using a path-defined LDEV with the following considerations:

- For hosts other than Windows 2000, Windows Server 2003, Windows Server 2008, VMware, AIX5.2 and AIX5.3, an LDEV cannot be used for LUSE operations using a path-defined LDEV.
- Before performing a LUSE operation on an LDEV with a path defined from a Windows 2000, Windows Server 2003, or Windows Server 2008 host, ensure that the host mode of the Windows operating system is 2C (Windows Extension). If the host mode is not 2C, change the host mode to 2C before performing the LUSE operation.
- Before performing a LUSE operation to an LDEV with a path defined from a VMware host, ensure that the host mode of the VMware host is 21 (VMware Extension). If the host mode is not 21, change the host mode to 21 before performing the LUSE operation.

2

Preparing for LUSE Operations

This chapter describes the environment you need to prepare in order to operate LUSE:

- ☐ System Requirements

System Requirements

In order to operate LUN Expansion (LUSE), you need the following items:

- Hitachi Universal Storage Platform V or Hitachi Universal Storage Platform VM (herein after referred to as USP V/VM) storage system.
- Storage Navigator computer
- Licensed LUN Expansion software.

To use the LUSE function, you need the software called Open Volume Management. This software is only for open systems.

3

Using the LUSE GUI

This chapter describes the graphical user interface (GUI) for LUN Expansion (LUSE) operations:

- LUN Expansion Window
- Set LUSE Confirmation Dialog Box
- Concatenation List Dialog Box
- Reset LUSE Confirmation Dialog Box
- Release LUSE Confirmation Dialog Box
- LUSE Detail Dialog Box

LUN Expansion Window

The following figure depicts the LUN Expansion (LUSE) window. Later sections in this chapter explain components of the LUSE window. For instructions on how to display this window, see Launching LUN Expansion (LUSE).

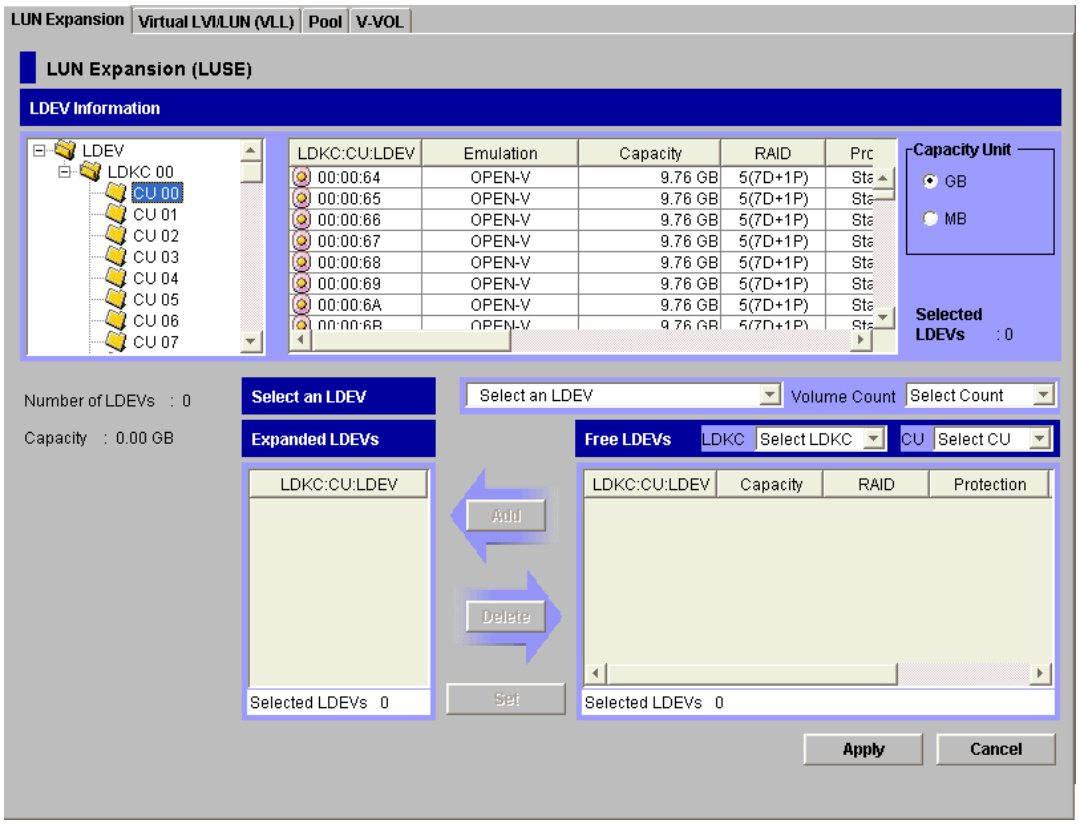

Figure 3-1 LUSE Window

LDEV Information Tree

The **LDEV Information** tree, on the upper left corner of the **LUN Expansion** window, provides an outline view of the LDKC (logical DKC) and CU numbers installed on the storage system.

LDEV Detail Table

The **LDEV Detail** table, on the upper right corner of the **LUN Expansion** window, shows detailed information for all open-system LDEVs in the selected CU. The table displays the following information:

Item	Description
LDKC:CU:LDEV	LDEV status icon (see Table 3-1), and the LDKC, CU, and LDEV numbers. If the selected LDEV is a LUSE volume, the LDEV number of the top LDEV in the LUSE volume appears. ▪ An LDEV number ending with # (e.g., 00:00:01#) indicates that the LDEV is an external volume. For details regarding external volumes, see the *Universal Volume Manager User's Guide*. ▪ An LDEV number ending with V (e.g., 00:00:01V) indicates that the LDEV is a virtual volume (V-VOL) for Copy-on-Write Snapshot. For details regarding V-VOLs, see the *Copy-on-Write Snapshot User's Guide*.
Emulation	Emulation type. If the selected LDEV is a LUSE volume, the emulation type appears together with an asterisk and the number of volumes in the LUSE volume (for example, OPEN-E*5).
Capacity	LDEV capacity, displayed in either MB or GB, depending on which unit is selected in the Capacity Unit box.
RAID	RAID level of the LDEV. The RAID level is left unspecified with a dash (-) mark when the LDEV is an external LU or virtual volume (V-VOL).
Protection	Data protection level. ▪ **SATA-W/V**: indicates the data protection level if the write and verify mode is set on a SATA drive. ▪ **SATA-E**: indicates the data protection level if the enhanced mode is set on a SATA drive. ▪ **Standard**: indicates if an FC drive, flash drive, external volume, or virtual volume (V-VOLs) is being used.
PG	Parity group. If the LDEV extends over two or more parity groups, the **PG** column displays the smaller parity group number. ▪ A parity group number starting with E (e.g., E1-1) indicates that the parity group consists of one or more external LUs. ▪ A parity group number starting with V (e.g., V1-1) indicates that the parity group consists of one or more virtual volumes (V-VOLs) for Copy-on-Write Snapshot.
Paths	Number of paths that are set for the LDEV. If this column shows the number of paths for an LDEV, you can use the LDEV as the top LDEV of a LUSE volume (see LUSE Operations Using a Path-defined LDEV).
Access Attribute	Access attribute that is set for the LDEV.
Cache mode	Local storage system cache mode. ▪ **Disable:** indicates the local storage system cache memory is set to be unused for responding to the I/O request for the external volume from the host. ▪ **Enable:** indicates the local storage system cache memory is set to be used for responding to the I/O request for the external volume from the host.

Item	Description
Ext. VOL Info	Drive type of external volumes. ▪ Asterisk (*) indicates a SATA or BD drive containing external volumes. ▪ Dollar sign ($) indicates a flash drive containing external volumes. ▪ Hyphen (-) indicates a drive containing internal volumes. ▪ Nothing is displayed for FC drives containing external volumes.
Int. VOL Info	Drive types of internal volumes. ▪ Asterisk (*) indicates a SATA drive containing internal volumes. ▪ Dollar sign ($) indicates a flash drive containing internal volumes. ▪ Hyphen (-) indicates a drive containing external volumes. ▪ Nothing is displayed for an FC drive containing internal volumes.
CLPR	The ID of the cache logical partition to which the displayed volume(s) belong. The CLPR ID is a two-digit number.
Pool ID	Number of a pool associated with virtual volumes (V-VOLs) for Dynamic Provisioning. ▪ Hyphen (-) indicates a virtual volume (V-VOL) for Dynamic Provisioning is not associated with a pool. ▪ Nothing is displayed for volumes that are not virtual volumes (V-VOLs) for Dynamic Provisioning.
Capacity Unit	Capacity, in either GB (default view) or MB, of the LDEV displayed in the **Capacity** column.
Selected LDEVs	Number of LDEVs that are selected in the LDEV Detail table.

Table 3-1 LDEV Status Icons

Icon	LDEV status
	Normal LDEV
	Expanded (LUSE) volume

LDEV Operation Detail

The remainder of the LUN Expansion window provides LDEV operational detail, as follows:

Item	Description
Select an LDEV	LDEVs and LUSE volumes of the selected CU that are eligible to become part of a LUSE volume appear in this list. The selected LDEV number becomes the top LDEV number of a LUSE volume.
Volume Count	Number of LDEVs that form a LUSE volume. For example, if you select **3** in the **Volume Count** box, three LDEVs are expected to form a LUSE volume and then three LDEVs are added to the **Expanded LDEVs** list. You can select an LDEV only from the **Volume Count** box. You cannot select a LUSE volume.
Expanded LDEVs	LDEVs that are selected as LUSE volume components. An LDEV is added to this list by clicking **Add**. ▪ **Selected LDEVs:** Number of LDEVs selected in the Expanded LDEVs list. ▪ **Number of LDEVs:** Number of LDEVs displayed in the Expanded LDEVs list. ▪ **Size:** Total capacity of the LDEVs displayed in the Expanded LDEVs list, in either GB or MB.
Free LDEVs table	LDEVs or LUSE volumes selected in the **Select an LDEV** box that are eligible to become part of a LUSE volume appear in this list. Use the lists on the upper right of the **Free LDEVs** table to narrow entries in this table. If you select an LDKC and a CU from the **LDKC** and **CU** lists, the **Free LDEVs** table shows only the LDEVs belonging to the selected LDKC and CU. ▪ **LDKC:CU:LDEV:** LDEV status icon (see Table 3-1) and the LDKC, CU, and LDEV numbers. If the selected LDEV is a LUSE volume, the LDEV number of the top LDEV in the LUSE volume is displayed. An LDEV number ending with # (e.g., 00:00:01#) indicates that the LDEV is an external volume. For details regarding external volumes, see the *Universal Volume Manager User's Guide*. An LDEV number ending with V (e.g., 00:00:01V) indicates that the LDEV is a virtual volume (V-VOL) for Copy-on-Write Snapshot. For details regarding V-VOLs, see the *Copy-on-Write Snapshot User's Guide*. ▪ **RAID:** RAID level of the LDEV. The RAID level is left unspecified with a "-" mark when the LDEV is an external LU or virtual volume (V-VOL). ▪ **Protection**: Data protection level. **SATA-W/V** indicates the data protection level if the write and verify mode is set on a SATA drive. **SATA-E** indicates the data protection level if the enhanced mode is set on a SATA drive. **Standard** indicates if an FC drive, flash drive, external volume, or virtual volume (V-VOLs) is being used. ▪ **PG:** Parity group. If the LDEV extends over two or more parity groups, the **PG** column displays the smaller parity group number. A parity group number starting with E (e.g., E1-1) indicates that the parity group consists of one or more external LUs. A parity group number starting with V (e.g., V1-1) indicates that the parity group consists of one or more virtual volumes (V-VOLs). ▪ **CLPR:** The cache logical partition number. For detailed information about CLPRs, see the *Virtual Partition Manager User's Guide*. ▪ **Selected LDEVs:** Number of LDEVs selected in the **Free LDEVs** table.
Add	Moves a selected LDEV from the **Free LDEVs** list to the **Expanded LDEVs** list.

Item	Description
Delete	Moves a selected LDEV from the **Expanded LDEVs** list to the **Free LDEVs** list.
Set	Creates a LUSE volume consisting of the volumes currently in the **Expanded LDEVs** list. The new LUSE appears in blue bold italics on the **LDEV Detail** table (on the upper right corner of the **LUN Expansion** window), but is not actually created until you click **Apply**.
Apply	Implements the settings to the storage system.
Cancel	Cancels the settings.

Set LUSE Confirmation Dialog Box

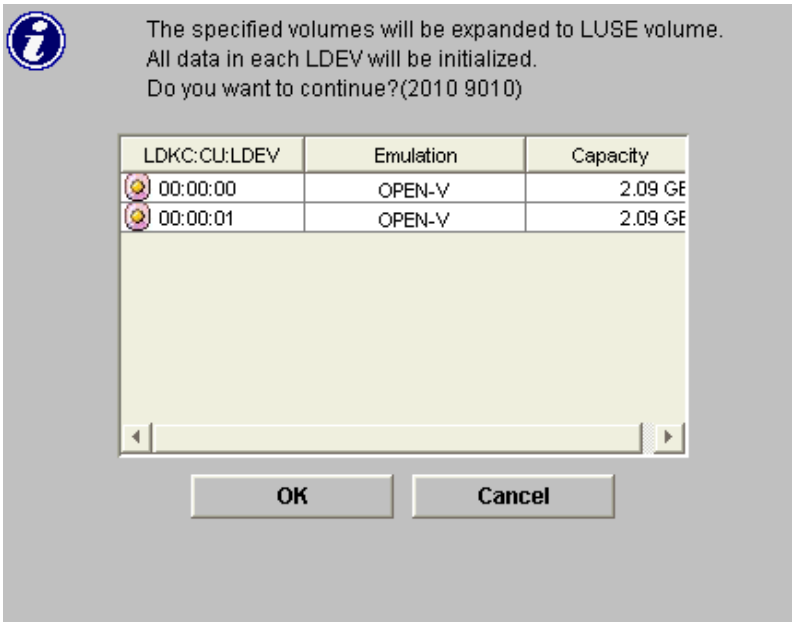

Figure 3-2 Set LUSE Confirmation Dialog Box

The LUSE components listed in this dialog box show information about the LDEVs that constitute the LUSE volume. Use this dialog box to verify the selected LDEVs before continuing with creating a LUSE volume.

Item	Description
LDKC:CU:LDEV	LDEV status icon (see Table 3-1), and the LDKC, CU, and LDEV numbers. ▪ An LDEV number ending with # (e.g., 00:00:01#) indicates that the LDEV is an external volume For details regarding external volumes, see the *Universal Volume Manager User's Guide*. ▪ An LDEV number ending with V (e.g., 00:00:01V) indicates that the LDEV is a virtual volume (V-VOL) for Copy-on-Write Snapshot. For details regarding V-VOLs, see the *Copy-on-Write Snapshot User's Guide*.
Emulation	Emulation type of the LDEV.
Capacity	Capacity of the LDEV.
OK	Creates the LUSE volume. Click this button to set the LUSE volume configuration having the LDEVs in the LUSE component list. The LDEVs registered as components of the LUSE volume are displayed in blue bold italics in the LDEV information list.
Cancel	Cancels the operation to create a LUSE volume using the LDEVs in the list.

Concatenation List Dialog Box

Use this dialog box to view concatenated parity groups.

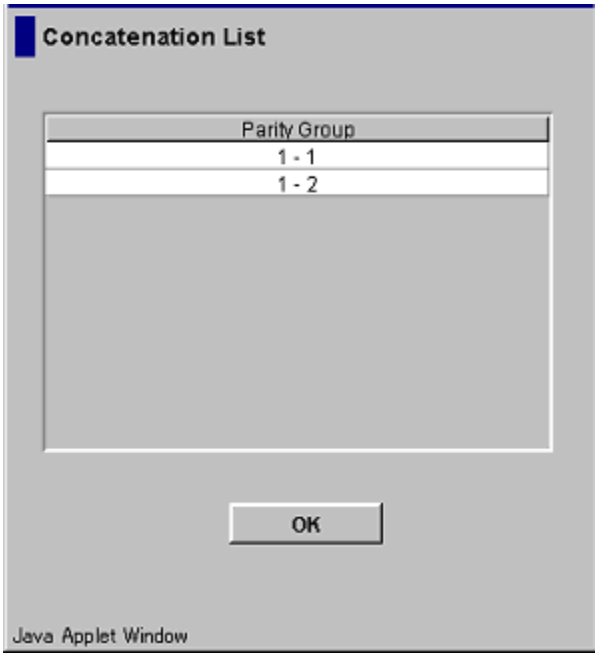

Figure 3-3 Concatenation List Dialog Box

Item	Description
Parity Group	Lists parity groups. A parity group number starting with E (e.g., E1-1) indicates that the parity group consists of one or more external LUs.
OK	Closes the dialog box.

Reset LUSE Confirmation Dialog Box

Use this dialog box to confirm the selected LUSE volumes before resetting them. The list in this dialog box shows the LDEVs created into a LUSE volume but not yet registered to the storage system. Click **OK** to reset the LUSE volume or click **Cancel** to reset to the state before they were created.

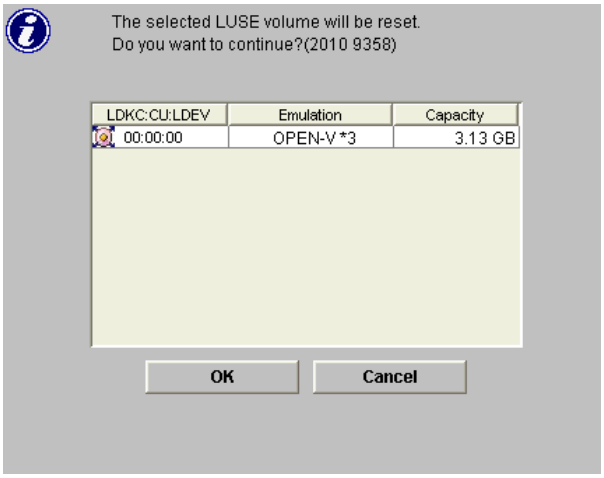

Figure 3-4 Reset LUSE Confirmation Dialog Box

Item	Description
LDKC:CU:LDEV	LDEV status icon (see Table 3-1), and the LDKC, CU, and LDEV numbers. ▪ An LDEV number ending with # (e.g., 00:00:01#) indicates that the LDEV is an external volume For details regarding external volumes, see the *Universal Volume Manager User's Guide*. ▪ An LDEV number ending with V (e.g., 00:00:01V) indicates that the LDEV is a virtual volume (V-VOL) for Copy-on-Write Snapshot. For details regarding V-VOLs, see the *Copy-on-Write Snapshot User's Guide*.
Emulation	Emulation type of the LDEV.
Capacity	Capacity of the LDEV.
OK	Creates the LUSE volume. Click this button to set the LUSE volume configuration having the LDEVs in the LUSE component list. The LDEVs registered as components of the LUSE volume are displayed in blue bold italics in the LDEV information list.
Cancel	Cancels the operation to create a LUSE volume using the LDEVs in the list.

Release LUSE Confirmation Dialog Box

This dialog box shows a list of LDEVs containing LUSE volumes to be released. If the selected LUSE volume has a path or if any other than a LUSE volume is selected, this dialog box lists only LDEVs containing a LUSE volume to be released.

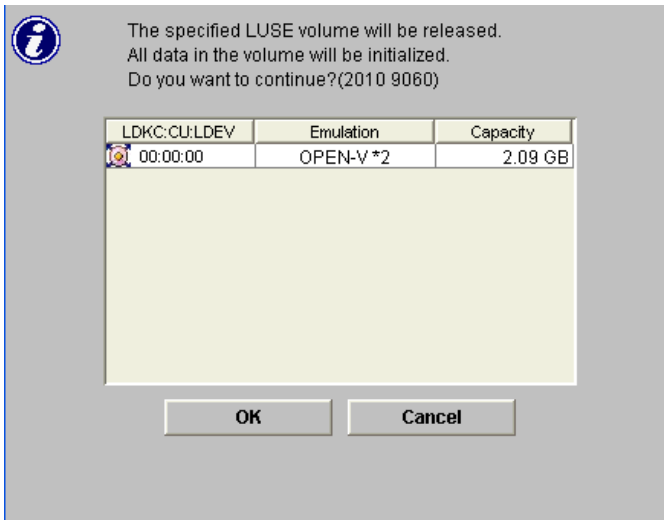

Figure 3-5 Release LUSE Confirmation Dialog Box

Item	Description
LDKC:CU:LDEV	LDEV status icon (see Table 3-1), and the LDKC, CU, and LDEV numbers. ▪ An LDEV number ending with # (e.g., 00:00:01#) indicates that the LDEV is an external volume For details regarding external volumes, see the *Universal Volume Manager User's Guide*. ▪ An LDEV number ending with V (e.g., 00:00:01V) indicates that the LDEV is a virtual volume (V-VOL) for Copy-on-Write Snapshot. For details regarding V-VOLs, see the *Copy-on-Write Snapshot User's Guide*.
Emulation	Emulation type of the LDEV.
Capacity	Capacity of the LDEV.
OK	Creates the LUSE volume. Click this button to set the LUSE volume configuration having the LDEVs in the LUSE component list. The LDEVs registered as components of the LUSE volume are displayed in blue bold italics in the LDEV information list.
Cancel	Cancels the operation to create a LUSE volume using the LDEVs in the list.

LUSE Detail Dialog Box

The LUSE Detail dialog box shows a list of volumes (LDEVs) combined into the LUSE volume.

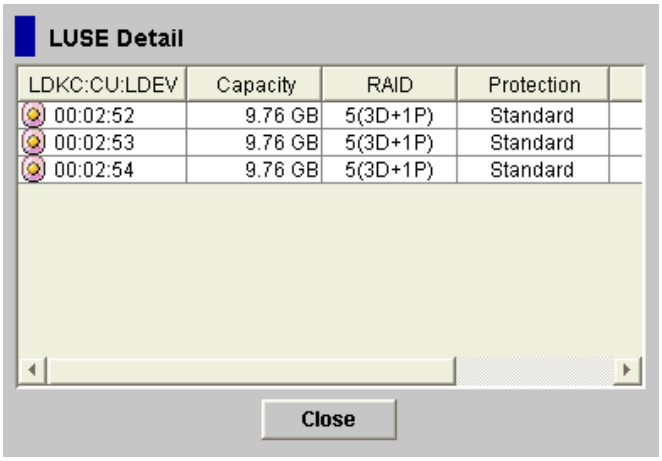

Figure 3-6 LUSE Detail Dialog Box

Item	Description
LDKC:CU:LDEV	LDEV status icon (see Table 3-1), and the LDKC, CU, and LDEV numbers. ▪ An LDEV number ending with # (e.g., 00:00:01#) indicates that the LDEV is an external volume For details regarding external volumes, see the *Universal Volume Manager User's Guide*. ▪ An LDEV number ending with V (e.g., 00:00:01V) indicates that the LDEV is a virtual volume (V-VOL) for Copy-on-Write Snapshot. For details regarding V-VOLs, see the *Copy-on-Write Snapshot User's Guide*.
Capacity	LDEV capacity.
RAID	RAID level of the LDEV. The RAID level is left unspecified with a dash (-) mark when the LDEV is an external LU or virtual volume (V-VOL).
Protection	Data protection level. ▪ **SATA-W/V**: indicates the data protection level if the write and verify mode is set on a SATA drive. ▪ **SATA-E**: indicates the data protection level if the enhanced mode is set on a SATA drive. ▪ **Standard**: indicates if an FC drive, flash drive, external volume, or virtual volume (V-VOLs) is being used.
PG	Parity group. ▪ A parity group number starting with E (e.g., E1-1) indicates that the parity group consists of one or more external LUs. ▪ A parity group number starting with V (e.g., V1-1) indicates that the parity group consists of one or more virtual volumes (V-VOLs).
CLPR	Cache logical partition number. For detailed information about CLPRs, see the *Virtual Partition Manager User's Guide*.
Close	Closes the LUSE Detail dialog box

4

Performing LUSE Operations

This chapter provides specific instructions for performing LUSE operations:

- ☐ Launching LUN Expansion (LUSE)
- ☐ Viewing Concatenated Parity Groups
- ☐ Creating a LUSE Volume
- ☐ Resetting an Unregistered LUSE Volume
- ☐ Releasing a LUSE Volume
- ☐ Changing LUSE Capacities
- ☐ Displaying a List of Volumes Combined into a LUSE Volume

Launching LUN Expansion (LUSE)

To launch LUN Expansion:

1. In the Storage Navigator main window, click **Go**, **LUN Expansion / VLL**, and then **LUN Expansion** on the menu bar. The LUSE window opens. This window allows you to perform LUSE operations.

   To exit LUSE, click the Logout button  on the upper right corner of the Storage Navigator main window, or end the Web browser.

   If you are going to implement any changes for LUN Expansion, you must have write permission for LUN Expansion.

2. You can view the current LUSE configuration on the LUSE window (see Figure 3-1).
   - The LDEV Information tree provides an outline view of the CU numbers in a hierarchical structure.
   - The LDEV Detail table provides detailed information for all open-system LDEVs in the selected CU.

Viewing Concatenated Parity Groups

In the USP V/VM storage system, data can be written to an LDEV that extends over concatenated parity groups. Concatenation of parity groups enables faster access to data.

To view a concatenated parity group:

1. Make sure that Storage Navigator is in **Modify** mode. For detailed information about Modify mode, see the *Storage Navigator User's Guide*.
2. Select a CU number from the **LDEV Information** tree. The **LDEV Detail** table displays all LDEVs in the selected CU.
3. In the **LDEV Detail** table, select and right click the free LDEVs that you want to form the LUSE volume. If parity groups are concatenated, the **Concatenation List** menu appears. The **Concatenation List** command does *not* appear if the selected LDEV does *not* extend over concatenated parity groups.
4. Select **Concatenation List** to open the Concatenation List dialog box (see Figure 3-3). A parity group number starting with **E** (e.g., E1-1) indicates that the parity group consists of one or more external LUs.
5. When you are finished viewing the list, select **OK** (or **Cancel**) to return to the **LUN Expansion** window.

Creating a LUSE Volume

WARNING: If a LUSE operation on a volume that has a path definition is executed, the integrity of the data on the LU that is expanded is guaranteed. However, a LUSE operation that occurs on a volume having no assigned path definition is a destructive operation. In this case, when a LUSE operation completes, the data on the LU that is expanded will be lost. Move and/or back up your data before proceeding.

There are three ways to create a LUSE volume:

- Using the **Volume Count** box (see Creating a LUSE Volume Using the Volume Count Box). This way is recommended.
- Using the **LDEV Detail** table (see Creating a LUSE Volume from the LDEV Detail Table)
- Using the **LDEV Operation** detail (**Select an LDEV** box) (see Creating a LUSE Volume From the LDEV Operation Detail)

Creating a LUSE Volume from the LDEV Detail Table

To create a LUSE volume from the LDEV detail table:

1. Make sure that Storage Navigator is in **Modify** mode. For detailed information about **Modify** mode, see the *Storage Navigator User's Guide*.
2. Select a CU number from the **LDEV Information** tree. The **LDEV Detail** table shows all LDEVs in the selected CU.
3. In the **LDEV Detail** table, select and right-click the normal LDEVs or LUSE volumes that you want to form the LUSE volume.
4. Select **Set LUSE Volume**. The Set LUSE confirmation dialog box opens asking what you want to do next. Verify that the LDEVs listed in the confirmation dialog box are the ones you want to use to create a LUSE volume.
   a. If you want to perform a LUSE operation on a volume that has a path definition, click **OK**. If a message appears and asks whether you want to perform a LUSE operation that will affect more than one SLPR or CLPR, go to step b. If such a message does not appear, go to step 5.

      If you want to cancel the LUSE operation, click **Cancel**. The previous dialog box opens where you can retry the operation.
   b. If you want to perform a LUSE operation that will affect more than one SLPR or CLPR, click **OK**. A confirmation dialog box appears. Then, go to step 5.

      If you want to cancel the LUSE operation, click **Cancel**. The previous dialog box opens where you can retry the operation.
   c. If the displayed dialog box is the Set LUSE Confirmation dialog box, go to step 5.
5. Click **OK** to create the LUSE volume (or **Cancel**). The new settings that appear on the window in blue bold italics are not yet registered to the storage system until you click **Apply**. The LUSE volumes that have been created but not yet registered to the storage system can be reset to the state before they were created (see Resetting an Unregistered LUSE Volume).
6. Click **Apply** (or **Cancel**).
7. Click **OK** (or **Cancel**).

Creating a LUSE Volume From the LDEV Operation Detail

To create a LUSE volume from the LDEV operation detail (**Select an LDEV** box):

1. Make sure that Storage Navigator is in **Modify** mode.

   For detailed information about **Modify** mode, see the *Storage Navigator User's Guide*.

2. Select a CU number from the **LDEV Information** tree (on the upper left corner of the **LUN Expansion** window).
3. Click the **arrow** button in the **Select an LDEV** box (on the lower right of the window). For the LUSE, select the first LDEV from the **Free LDEVs** list that displays available LDEVs.

   Use the lists on the upper right of the **Free LDEVs** list to narrow entries in this table. If you select an LDKC and a CU from the **LDKC** and **CU** lists, the **Free LDEVs** table displays only the LDEVs belonging to the selected LDKC and CU.
4. Select one or more additional normal LDEVs or LUSE volumes for the LUSE volume. Select **<<Add** to move the selected LDEVs from the **Free LDEVs** list to the **Expanded LDEVs** list.
5. If you want to delete an LDEV from the **Expanded LDEVs** list, and move it back to the **Free LDEVs** list, select one or more volumes. Click **Delete>>**.
6. Click **Set**. A dialog box appears asking what you want to do next.
   a. If you want to perform a LUSE operation on a volume that has a path definition, click **OK**. If a message appears and asks whether you want to perform a LUSE operation that will affect more than one SLPR or CLPR, go to step b. If such a message does not appear, go to step 7.

      If you want to cancel the LUSE operation, click **Cancel**. The previous dialog box opens where you can retry the operation.
   b. If you want to perform a LUSE operation that will affect more than one SLPR or CLPR, click **OK**. A confirmation dialog box appears. Then, go to step 7.

      If you want to cancel the LUSE operation, click **Cancel**. The previous dialog box opens where you can retry the operation.
   c. If the displayed dialog box is the Set LUSE Confirmation dialog box, go to step 7.
7. Click **OK** (or **Cancel**). The new settings that appear on the window in blue bold italics are LUSE volumes that have been created but not yet registered to the storage system until you click **Apply**. These LUSE volumes can be reset to the state before they were created (see Resetting an Unregistered LUSE Volume).
8. Click **Apply** (or **Cancel**).
9. Click **OK** (or **Cancel**).

Creating a LUSE Volume Using the Volume Count Box

To create a LUSE volume using the Volume Count box:

1. Make sure that Storage Navigator is in **Modify** mode.

   For detailed information about **Modify** mode, see the *Storage Navigator User's Guide*.

2. Select a CU number to create a LUSE volume from the LDEV information tree.
3. Click the arrow button in **Select an LDEV**. Select a top LDEV of the LUSE volume from the list.

   The selected top volume appears in the **Expanded LDEVs** list. Normal LDEVs and LUSE volumes that can be used for a LUSE volume are displayed in the **Free LDEVs** list.

   Use the lists on the upper right of the **Free LDEVs** list to narrow entries in this table. If you select an LDKC and a CU from the **LDKC** and **CU** lists, the **Free LDEVs** table displays only the LDEVs belonging to the selected LDKC and CU.
4. Select the number of LDEVs needed to form a LUSE volume from the **Volume Count** box.

   The **Expanded LDEVs** list displays as many LDEVs as specified in the **Volume Count** box. For example, if **3** is specified in **Volume Count**, three LDEVs appear in **Expanded LDEVs**.

   You cannot select LUSE volumes from the **Volume Count** box. To select LUSE volumes, select LDEVs from **Free LDEVs** and select **<<Add**.

   a. Select normal LDEVs or LUSE volumes from **Free LDEVs** to add more LDEVs to the **Expanded LDEVs** list, and then select **<<Add**.

   b. To delete LDEVs from the **Expanded LDEVs** list, select the LDEVs from the **Expanded LDEVs** list, and then select **Delete>>**.
5. Click **Set**. A dialog box appears asking what you want to do next.

   a. If you want to perform a LUSE operation on a volume that has a path definition, click **OK**. A message appears and informs you that the specified volumes will be expanded to LUSE volume. Next, go to step 6.

      If you want to cancel the LUSE operation, click **Cancel**. The previous dialog box opens where you can retry the operation.

   b. If the dialog box is the Set LUSE Confirmation dialog box, go to step 6.

   To create the LUSE, select **OK**. The selected top LDEV appears (in blue bold italics) as a LUSE volume in the LDEV list.

   The LUSE volumes that have been created but not yet registered to the storage system (those in blue bold italics) can be reset to the state before they were created (see Resetting an Unregistered LUSE Volume).
6. Click **Apply**.
7. Click **OK** (or **Cancel**). The setting by this LUSE operation is registered for the storage system.

Resetting an Unregistered LUSE Volume

When you create a LUSE volume, it will remain highlighted in blue bold italics until you register it into the storage system by clicking **Apply**. The LUSE volume in blue bold italics indicates that you can reset this LUSE volume to the state before it was created.

This is function allows you to reset an unregistered LUSE volume to the state it was in before it was created. However, it does *not* allow you to recover any LUSE volumes that have been released already to the state they were in when they were created. Therefore, if the LUSE volume that you have created consists of any LDEVs (those in blue bold italics) that have once been released from a different LUSE volume, your LUSE volume can only be reset to the state when the constituting LDEV or LDEVs was/were released from that different LUSE volume.

To reset an unregistered LUSE volume:

1. Make sure that Storage Navigator is in **Modify** mode. For detailed information about **Modify** mode, see the *Storage Navigator User's Guide*.
2. Select a CU number from the **LDEV Information** tree (on the upper left corner of the **LUN Expansion** window). The **LDEV Detail** table (on the upper right corner of the **LUN Expansion** window) shows all LDEVs in the selected CU.
3. Select an unregistered LUSE volume (in blue bold italics) in the **LDEV Detail** table (on the upper right corner of the **LUN Expansion** window). Right-click the selected LUSE volume to display the menu that includes the **Reset Selected Volume** command used to execute the LUSE volume reset operation.
4. Click **Reset Selected Volume**. The Reset LUSE Confirmation dialog box (see Figure 3-4) opens to confirm the LUSE volume reset operation.
5. Click **OK** on the dialog box for confirming the LUSE volume reset operation.

The setting of the selected LUSE volume that is not yet registered will be reset to the state before this LUSE volume was created, and the LUSE volumes or the LDEVs constituting the selected LUSE volume that has just been reset will appear in the **LDEV Detail** table (on the upper right corner of the **LUN Expansion** window).

Releasing a LUSE Volume

WARNING: Releasing LUSE volumes is a destructive operation. When a releasing LUSE operation completes, the data on the LU that is expanded will be lost. Move and/or back up your data before proceeding.

To release a LUSE volume:

1. Make sure that Storage Navigator is in **Modify** mode. For detailed information about **Modify** mode, see the *Storage Navigator User's Guide*.
2. Select a CU number from the **LDEV Information** tree (on the upper left corner of the **LUN Expansion** window). The **LDEV Detail** table (on the upper right corner of the **LUN Expansion** window) displays all LDEVs in the selected CU.
3. Select a LUSE volume in the **LDEV Detail** table (on the upper right corner of the **LUN Expansion** window). Right-click the LUSE volume to display the **Release LUSE Volume** menu.
4. Click **Release LUSE Volume**.
5. In the Release LUSE Volume Confirmation dialog box (Figure 3-5), verify that the LUSE volumes(s) listed are the one(s) that you want released.
6. Click **OK** (or **Cancel**). The new settings appear on the **LUN Expansion** window in blue bold italics but are not yet implemented.
7. Click **Apply** on the **LUN Expansion** window (or **Cancel**).
8. Click **OK** (or **Cancel**).

Changing LUSE Capacities

There are two ways to change the capacity of a LUSE volume:

- Expanding LUSE capacities

  To expand the capacity of a LUSE volume, select a LUSE volume that you want to expand, and then add LDEVs or LUSE volume(s), or first select LDEVs or LUSE volume(s) that you want to add, and then select a LUSE volume to be expanded. For further information, see Creating a LUSE Volume.

- Reducing LUSE capacities

  You may not reduce the capacity of an existing LUSE volume. If you want a LUSE volume to have a smaller capacity, you must first release the LUSE volume (see Releasing a LUSE Volume) and then re-define the LUSE volume (see Creating a LUSE Volume.

Displaying a List of Volumes Combined into a LUSE Volume

A LUSE volume is a combination of multiple volumes (LDEVs).

To display a list of volumes combined into one LUSE volume:

1. Make sure that Storage Navigator is in **Modify** mode. For detailed information about **Modify** mode, see the *Storage Navigator User's Guide*.
2. Select a LUSE volume in the **LDEV Detail** table (on the upper right corner of the **LUN Expansion** window). Right-click a LUSE volume to display a menu.
3. Select **LUSE Detail** from the menu.
4. Review the details in the LUSE Detail dialog box (Figure 3-6). After viewing this list, click **Close** to close the dialog box.

5

Using Spreadsheets for LUSE Operations

To use LUSE functions, you may want to use spreadsheets instead of the Storage Navigator graphical user interface (GUI). For example, when you want to create or release many LUSE volumes at a time, using the spreadsheets shortens the operation time compared to when using the GUI. You can import the spreadsheets directly to the storage system using the Storage Navigator command line interface (CLI).

The following figure describes the work flow when you use spreadsheets:

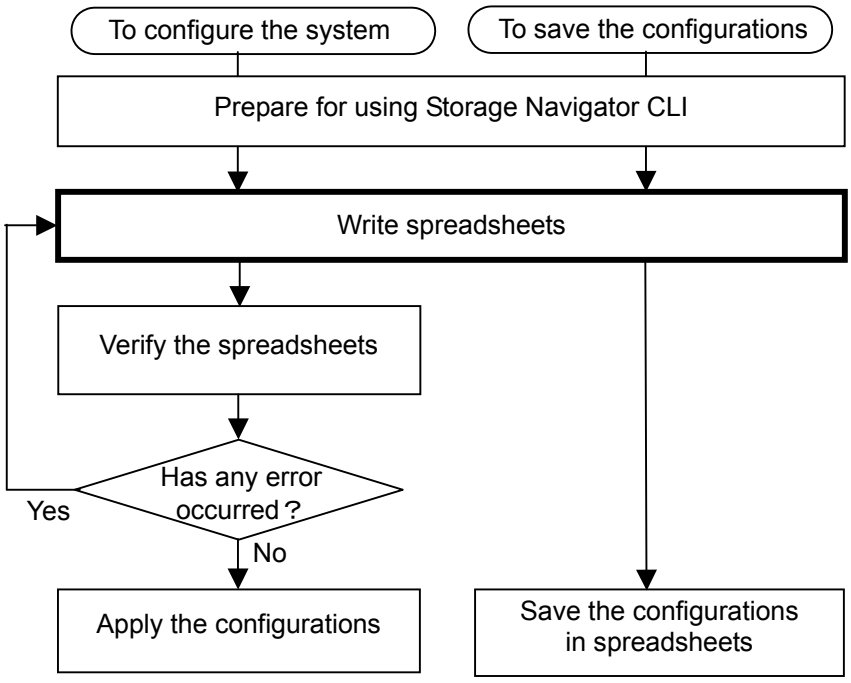

Figure 5-1 Work Flow for Using Spreadsheets

This chapter describes the operation that is surrounded by the thick lines in Figure 5-1. For detailed information about the other operations, see *the Storage Navigator User's Guide*.

If there are errors in a spreadsheet, all the errors may not be detected during verifying the spreadsheet. In this case, errors may occur during applying the configurations.

- ☐ Before Using Spreadsheets
- ☐ Available Types and Operation Tags
- ☐ Saving LDEVs Information
- ☐ Creating LUSE Volumes
- ☐ Releasing LUSE Volumes

Before Using Spreadsheets

Storage Navigator is required to use spreadsheets. In addition, you must use Storage Navigator CLI (not the Configuration File Loader window) when you perform operations on spreadsheets.

Spreadsheets must be written in the format below. Multiple operation tags and parameters can be written in a spreadsheet.

```
#!Version Version number,Program product,Type,;
[Operation tag]
Parameter
```

Italic type indicates variables that should be changed according to program products or operations. The following table shows how you should write these elements.

Table 5-1 Contents of a Spreadsheet

Element	Content
Version number	See Available Types and Operation Tags.
Program product	CLI_LUSE
Type	See Available Types and Operation Tags.
Operation tag	
Parameter	See Saving LDEVs Information and the subsequent sections.

Available Types and Operation Tags

Available operation tags differ depending on the types. The version number that you write in the spreadsheet declaration depends on the operation tags. The following table shows the relationship among types, operation tags, and version numbers supported by LUN Expansion.

Table 5-2 Relationship Among the Types, Operation Tags, and Version Number

Type	Operation Tag	Version Number	Template
Get	LUSE	05_03_01	Luse_Get_def.spd
VolumeOperation	Expansion	05_03_01	Luse_Expansion_def_.spd
	Release		Luse_Release_def_.spd

The above operation tags can be used only for LUN Expansion. In addition, other operation tags that are common for all program products can also be used in a spreadsheet. For details on common operation tags, see *the Storage Navigator User's Guide*. For detailed information about the parameters for each operation tag, see the following sections.

You can quickly write a spreadsheet if you make a copy of the provided templates and then modify the copy. For information about the location of the templates, see *the Storage Navigator User's Guide*.

Saving LDEVs Information

You can save information about LDEVs that have been or can be combined into LUSE volumes in a file. To do this, specify a spreadsheet when you execute the CFLGET command using the Storage Navigator CLI. Specify the LUSE tag as shown below. By specifying GET_ALL parameter in the LUSE tag, information about the combined LDEVs in a LUSE volume and uncombined LDEVs will be saved in a file.

```
[LUSE]
GET_ALL,;
```

The information about combined LDEVs is listed in a hierarchical structure by using the "+" identifier. The following table shows the hierarchical structure and the identifier in a saved file.

Table 5-3 Structure and Identifier of LUSE Tag Parameters

Layer	Identifier	Content
The first layer	None	The following information is listed: The top LDEV in the LUSE volume Uncombined LDEVs
The second layer	+	The information about the combined LDEVs in a LUSE volume

The following table shows the information that will be saved in a file when the LUSE tag is written in a spreadsheet.

Table 5-4 Information Saved when the LUSE Tag is Written

Layer	Column in Spreadsheet	Item	Content
The first layer	A	LDKC	LDKC number of the top LDEV in a LUSE volume.
	B	CU	CU number of the top LDEV in a LUSE volume.
	C	LDEV	LDEV number of the top LDEV in a LUSE volume.
The second layer	A	+	Identifier.
	B	LDKC	LDKC number of the combined LDEVs in a LUSE volume.
	C	CU	CU number of the combined LDEVs in a LUSE volume.
	D	LDEV	LDEV number of the combined LDEVs in a LUSE volume.

The following example shows the information about a LUSE volume and LDEVs that can be saved by executing the CFLGET command:

- The LUSE volume is configured as follows:
  - Number of combined LDEVs in a LUSE volume: 3
  - LDEV:CU:LDEV number of the top LDEV in a LUSE volume: "00:00:00"
  - LDEV:CU:LDEV numbers of the combined LDEVs: "00:00:01", and "00:00:02"
- The LDEVs that have not been but can be combined are as follows:

  LDEV:CU:LDEV numbers: "00:00:10", "00:01:00", "00:10:01"

The file to be saved is as follows. The line beginning with # is a comment. For details about using the Storage Navigator CLI, see *the Storage Navigator User's Guide*:

```
#!Version 05_03_01,CLI_LUSE,Get,;

[SerialNumber]
65536,;

[LUSE]
#LDKC,CU,LDEV,;
#+,LDKC,CU,LDEV,;
00,00,00,;
+,00,00,01,;
+,00,00,02,;
00,00,10,;
00,10,00,;
00,10,01,;
```

Creating LUSE Volumes

You can combine LDEVs to create LUSE volumes by specifying a spreadsheet that includes the Expansion tag when you execute the CFLSET command using the Storage Navigator CLI.

Write parameters required for creating LUSE volumes in the Expansion tag. Parameters must be written in a hierarchical structure by using the "+" identifier. Keep the following in mind while writing parameters in the Expansion tag.

- Number of LDEVs combined into a LUSE volume must be within the range of 2 to 36
- LDEV:CU:LDKC numbers of the top LDEVs in LUSE volumes must be arranged in ascending order
- LDEV numbers of the LDEVs to be combined into a LUSE volume must be arranged in ascending order

The following table shows the structure and identifier of the parameters that can be set for the Expansion tag.

Table 5-5 Structure and Identifier of Expansion Tag Parameters

Layer	Identifier	Content
The first layer	None	The information about the top LDEV in a LUSE volume
The second layer	+	The information about the combined LDEVs in a LUSE volume

The following table shows the parameters that can be set for the Expansion tag.

Table 5-6 Expansion Tag Parameters

Layer	Column in Spreadsheet	Item	Content
The first layer	A	LDKC	LDKC number of the top LDEV in a LUSE volume.
	B	CU	CU number of the top LDEV in a LUSE volume.
	C	LDEV	LDEV number of the top LDEV in a LUSE volume.
The second layer	A	+	Identifier.
	B	LDKC	LDKC number of the combined LDEV in a LUSE volume.
	C	CU	CU number of the combined LDEV in a LUSE volume.
	D	LDEV	LDEV number of the combined LDEV in a LUSE volume.

The following example shows the spreadsheet that can be used for creating three LUSE volumes:

- The first LUSE volume is configured as follows:
  - Number of LDEVs to be combined: 3
  - LDEV:CU:LDKC numbers of above 3 LDEVs: "00:00:00", "00:00:01", and "00:00:02"
- The second LUSE volume is configured as follows:
  - Number of LDEVs to be combined: 3
  - LDEV:CU:LDKC numbers of above 3 LDEVs: "00:00:10", "00:00:21", and "00:00:22"
- The third LUSE volume is configured as follows:
  - Number of LDEVs to be combined: 2
  - LDEV:CU:LDKC numbers of above 2 LDEVs: "00:10:00", and "00:10:01"

The example of a spreadsheet is as follows:

```
#!Version 05_03_01,CLI_LUSE,VolumeOperation,;

[SerialNumber]
65536,;

[Expansion]
00,00,00,;
+,00,00,01,;
+,00,00,02,;
00,00,10,;
+,00,00,21,;
+,00,00,22,;
00,10,00,;
+,00,10,01,;
```

Releasing LUSE Volumes

You can release LUSE volumes by specifying a spreadsheet that includes the Release tag when you execute the CFLSET command using the Storage Navigator CLI.

Write parameters required for releasing LUSE volumes in the Release tag. It is recommended that you arrange the number of the top LDEV:CU:LDKC of LUSE volumes in ascending order when writing parameters in the Release tag. The following table shows the parameters that can be set for the Release tag.

Table 5-7 Release Tag Parameters

Column in Spreadsheet	Item	Content
A	LDKC	LDKC number of the top LDEV in a LUSE volume.
B	CU	CU number of the top LDEV in a LUSE volume.
C	LDEV	LDEV number of the top LDEV in a LUSE volume.

The following example shows the spreadsheet that can be used for releasing three LUSE volumes. LUSE volumes to be released are as follows:

- Number of LUSE volumes: 3
- Top LDEV:CU:LDKC numbers of 3 LUSE volumes: "00:00:00", "00:00:10", and "00:10:02"

The example of a spreadsheet is as follows. The line beginning with # is a comment. For details about using the Storage Navigator CLI, see *the Storage Navigator User's Guide*:

```
#!Version 05_03_01,CLI_LUSE,VolumeOperation,;

[SerialNumber]
65536,;

[Release]
00,00,00,;
#+,00,00,01,;
#+,00,00,02,;
00,00,10,;
#+,00,00,21,;
#+,00,00,22,;
00,10,00,;
#+,00,10,01,;
```

6

Troubleshooting

This chapter explains how to troubleshoot problems that you might experience while using LUSE.

- Troubleshooting LUN Expansion
- Calling the Hitachi Data Systems Support Center

Troubleshooting LUN Expansion

- For troubleshooting information on the USP V/VM storage system, see the USP V/VM *User's and Reference Guide*.
- For troubleshooting information on the Storage Navigator software, see the *Storage Navigator User's Guide*.
- For information on the USP V/VM Storage Navigator error codes, see *Storage Navigator Messages*.

Calling the Hitachi Data Systems Support Center

If you need to call the Hitachi Data Systems Support Center, make sure to provide as much information about the problem as possible, including:

- The circumstances surrounding the error or failure.
- The exact content of any error messages displayed on the host system(s).
- The exact content of any error messages displayed by Storage Navigator.
- The Storage Navigator configuration information (use the FD Dump Tool).
- The service information messages (SIMs), including reference codes and severity levels, displayed by Storage Navigator.

The Hitachi Data Systems customer support staff is available 24 hours/day, seven days a week. If you need technical support, please call:

- United States: (800) 446-0744
- Outside the United States: (858) 547-4526

Acronyms and Abbreviations

cache extents	Areas used for Cache Residency Manager
Cache Residency Manager	dynamic cache residency
CU	control unit
custom access	A feature that allows a non-administrator to be assigned update access to one or more of the restricted Remote Console functions.
FD	floppy disk
FD Copy	floppy disk copy
GB	gigabyte (see Convention for Storage Capacity Values)
KB	kilobyte (see Convention for Storage Capacity Values)
LAN	local-area network
LBA	logical block address
LDEV	logical device
LU	logical unit
LUN	logical unit number
LUN Manager	Remote Console software option.
LUSE	Logical Unit Size Expansion
MB	megabyte (see Convention for Storage Capacity Values)
MIB	message information block
parity group	A set of hard disk drives that have the same capacity and are treated as one group. A parity group contains both user data and parity information, which allows the user data to be accessed in the event that one or more of the drives within the group are not available.
PB	petabyte (see Convention for Storage Capacity Values)
RMCMAIN	remote console main software
R-SIM	remote service information message.
SCSI	small computer system interface
ShadowImage	Hitachi Multi-RAID Coupling Feature and/or Hitachi Open Multi-RAID Coupling Feature.

SIM	service information message (generated by a disk controller when it detects an error or service requirement).
SSID	storage subsystem ID.
SVP	service processor
TB	terabyte (see Convention for Storage Capacity Values)
TCP/IP	transmission control protocol/internet protocol
TID	target ID
Trap	An SNMP agent initiates trap operations when R-SIMs occur, in order to send the R-SIMs to the SNMP manager. An SNMP agent can be configured to deliver traps to more than one SNMP manager.
UCB	unit control block
Volser	volume serial number (mainframe volume identifier, not related to the LDEV ID)
V-VOL	virtual volume
WWN	Worldwide Name, which is a unique identifier for a particular open-system host, consisting of a 64-bit physical address (the IEEE 48-bit format with 12-bit extension and 4-bit prefix).

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